REMARKS

This Reply is responsive to an Office Action dated November 3, 2006 and is filed with a petition for a one-month extension of time along with the authorization to charge the extension fee. In the Office Action, claims 1, 2, 10, 14 and 16-22 were rejected based on 35 U.S.C. 112 first paragraph, 35 U.S.C. 112 second paragraph, 35 U.S.C. 101 and cited art. Regarding cited art, Claims 1, 10 and 14 are rejected under 35 U.S.C. §102(b) as being anticipated by either one of Putterman et al. (U.S. 5,659,173) or Flynn (U.S. 4,333,796), claims 16-22 based on Putterman and claim 2 under 35 U.S.C. §103(a) as being unpatentable over Putterman or Flynn, in view of Taleyarkhan et al. The remaining claims 3-9, 11-13, 15 and 23-75 were all withdrawn pursuant to a restriction imposed.

In this Reply, claims 1, 2, 10, 16 and 20 have been amended, and claims 19 and 22 have been cancelled. No new matter has been added. The amendment to claim 16 and cancellation of claim 19 overcomes the 35 U.S.C. 112 second paragraph rejection regarding these claims.

To permit clear identification, all citations to the present application herein will be with regard to U.S. Published Application No. 20030074010, published on April 17, 2003.

With regard to the Examiner's question in section 5 of the Office Action regarding the reference list at the end of Applicant's application, the respective references are not prior art, and are rather only provided as references to support selected portions of Applicant's disclosure, such as "For example, cavitation of ordinary tap water has been demonstrated with only a few psi of tension, due to impurities in the water. [4]".

Turning now to the claimed invention, as amended, independent claim 1 recites:

1. (Currently amended) A burst generator, comprising:

structure for placing at least a portion of a degassed liquid into a tension state, said tension state being below a cavitation threshold of said liquid, said tension state imparting stored mechanical energy into said liquid portion;

~~structure~~ a source of fundamental particles for directing fundamental particles at said liquid portion for cavitating said liquid portion sufficiently to bubble nucleate at least one bubble having a bubble radius greater than a critical bubble radius of said liquid, formation of said bubble releasing at least a portion of said energy stored in said tension state.

Support for the "degassed liquid" recited in claim 1 can be found in paragraph 71 which discloses this important aspect of the claimed invention:

[0071] Liquid and system preparation can be an important consideration in conjunction with use of pretensioning and cavitation initiation apparatus. The key parameters to be controlled are gas content, microscopic impurities, cleanliness of the structural components and system temperature. *For attaining large metastable states, the liquids should be degassed, using methods such as ultrasonic agitation under vacuum, or via boiling.*

Support for the structure for cavitating being a source of fundamental particles can be found throughout Applicant's specification, such as paragraph 54 which describes a neutron source, as well as, for example, paragraphs 78 and 93.

Support for the amendment of claim 2 which recites for the claimed centrifugal source "said portion in said tension state is an entire volume of said liquid" can be found in paragraph 83 which discloses "A centrifugal source can be used to produce significant levels of tension through the entire volume of a working liquid".

Regarding the Drawings, according to the Examiner:

3. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the source of fundamental particles, controller, and structure for condensing vapor into liquid state must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

The drawings are also objected to because lines defining the elements and their interrelationships are not well defined (e.g., see Figs. 1 and 4), some elements are not numbered (e.g., see Fig. 6).

The source of fundamental particles is shown in Fig. 1 as cavitation initiation source 105, which is described as being a source of fundamental particles in one embodiment. (See, for example, paragraph 54 which describes a neutron source (see also paragraphs 78 and 93). Figure 1 has been amended to now show a controller 108 coupled to the cavitation initiation source. Paragraph 49 of the specification has been amended to reflect controller 108 "A controller 108 coupled to cavitation initiation source 105" is provided for synchronizing delivery of at least one cavitation signal from the Cavitation initiation source 105. Claims 19 and 22 have been cancelled to remove the need to show the claimed features that had been recited in these claims.

Regarding Figure quality, amended Figs. 1, 4 and 6 which now have well defined lines have been provided. Reference 600 used in the present specification for system 600 has been added to Fig. 6. Accordingly, all the objections to the drawings are now overcome.

Before reviewing the 35 U.S. C. 101, 102, 103 and 112 rejections, Applicant will first review the claimed invention as recited in amended claim 1:

1. (Currently amended) A burst generator, comprising:

structure for placing at least a portion of a degassed liquid into a tension state, said tension state being below a cavitation threshold of said liquid, said tension state imparting stored mechanical energy into said liquid portion;

a source of fundamental particles for directing fundamental particles at said liquid portion for cavitating said liquid portion sufficiently to bubble nucleate at least one bubble having a bubble radius greater than a critical bubble radius of said liquid, formation of said bubble releasing at least a portion of said energy stored in said tension state.

Applicant first notes claim 1 and its respective dependent claims are drawn to a burst generator, not a nuclear fusion reactor. According, there is clearly no requirement for Applicant to indicate the invention has been reduced to providing "an operative nuclear system (including one that generates nuclear fusion and reaction products)" as required by the examiner in the Office Action to show operability and thus utility.

> There is no reputable evidence of record to indicate the invention has been reduced to the point of providing in current available form, an operative nuclear system (including one that generates nuclear fusion and reaction products). The invention is not considered as meeting the requirements of 35 U.S.C. 101 as being "useful". Note in this respect," Star in a Jar", Popular Science, 12/1998 which indicates that there is no convincing evidence that the phenomena attributed to sonoluminescence would produce useful sources of energy.

> There is no reputable evidence of record to support any allegations or claims that the invention is capable of operating as indicated in the specification, that any allegations or claims of imploding a bubble that results in temperature sufficient to induce nuclear fusion reaction in a liquid or its vapor.

Although the present specification mentions the claimed burst generator can induce nuclear fusion under certain conditions, the present specification describes numerous other utilities for the claimed burst generator (see the Summary paragraphs 18-25), including an armament, such as a gun or a rifle, a medical device (see Fig. 6 and associated description), and a pulse generator. In the case of the pulse generator, "Bursts from the pulse generator can be directed to propel a liquid through an orifice, such as in a MEMS device, the orifice being no larger than micron scale". Operability of the claimed burst generator is demonstrated in the Examples in the present application, including projectile launching and power surges (above the power provided by the drive source), as copied below:

EXAMPLES

[0119] 20 Proof-of-principle experiments with organic and inorganic liquids have been conducted for placing various liquids under tension and then perturbing the system using fundamental particles including neutrons from small hand-portable neutron sources and other methods to initiate explosive vaporization within nanoseconds. Various metastable states have been created and demonstrate controlled explosive burst generation using a range of neutron energies as well as with dissolved emitters.

[0120] It has been demonstrated that controlled explosive bursts can be generated and coupled to launch projectiles, and also to cause shock-burst type effects. The experimental work was performed in both a static environment, such as a fluid field where the pressure state is not changing and in a dynamic environment where the pressure state is changing continuously at high frequencies (e.g., 10-20 kHz).

[0121] Experiments were conducted with a spinner arrangement using a working liquids, such as ethanol or acetone. Upon reaching a certain state of pretension the system was nucleated with an external fast neutron source (Pu--Be). The vaporization of fluid in the central bulb caused a fast pressure surge that ejected a projectile.

[0122] In another example, 20 kHz experiments were performed using a glass chamber filled with acetone. The cavitation initiating source for nucleated vapor cavities used was a neutron source, such as a Pu--Be neutron source or a pulsed neutron generator. The vapor cavity growth produced measured power surges of close to 5-10 kW even though the driving power from the 20 kHz drive transducers was only in the 1-5W range. Similar experiments were performed using C.sub.2Cl.sub.4 as the working liquid with similar results.

Accordingly, since both operability and utility for the claimed burst generator is clearly evident based on Applicant's specification, the 35 USC 101 rejection is completely unfounded and should be removed.

Regarding the 35 USC 112, second paragraph rejections, the Examiner's rejection regarding the term "portion" in claim 1 will now be addressed. According to the Examiner:

> As to claim 1, the term "portion" is a relative term that renders the claim indefinite. The term "portion" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. Accordingly, the cavitation of the tensioned liquid with nuclear particles is indefinite.

Applicant respectfully disagrees with the Examiner's assertion above. As claimed the claimed "structure for placing at least a portion of a degassed liquid into a tension state" imparts a "tension state being below a cavitation threshold of said liquid" which "imparts stored mechanical energy into said liquid portion". The claimed "source of fundamental particles" directs "fundamental particles at said liquid portion for cavitating said liquid portion sufficiently to bubble nucleate at least one bubble having a bubble radius greater than a critical bubble radius of said liquid". The present application provides a detailed teaching regarding the portion of the liquid which is tensioned, and the degree at which tensioning is to be performed.

Paragraphs 39 and 40 (copied below) describe reaching a tension state in a liquid portion referred to as a metastable liquid portion and then having the cavitation energy is directed to the *metastable liquid portion*. The energy signal provides sufficient energy to cavitate the liquid through bubble nucleation of at least one bubble having a bubble radius greater than a critical bubble radius for the specific liquid used. Formation of bubbles of at least the critical size

results in bubble growth and can lead to the release of at least a portion of the energy stored by the liquid in the metastable state.

[0039] The invention includes methods and apparatus for placing a liquid into a metastable state, such as a tension state, and applying energy to cavitate the liquid to quickly and controllably release a portion of the energy stored in the metastable state. For example, if liquid tensioning is used, a tension state is first reached which is below a cavitation threshold for the liquid. A tension state imparts stored mechanical energy into a portion of a liquid, or can impart mechanical energy into the entire liquid volume. Liquid tensile states are one example of a metastable state (as defined below).

[0040] In the case of tensioning, after the metastable state is reached, at least one initiation signal from a source of cavitation energy is directed to the *metastable liquid portion*. The energy signal provides sufficient energy to cavitate the liquid through bubble nucleation of at least one bubble having a bubble radius greater than a critical bubble radius for the specific liquid used. Formation of bubbles of at least the critical size results in bubble growth and can lead to the release of at least a portion of the energy stored by the liquid in the metastable state.

The working liquid "portion" that is tensioned can be less than the full volume of the working liquid, or the full working liquid volume as described in paragraph 39 above "A tension state imparts stored mechanical energy into a portion of a liquid, or can impart mechanical energy into the entire liquid volume", such as when a centrifugal source is used as discussed in paragraph 83.

The degree of tensioning the liquid portion is also described, where it is described as being high enough to reach a metastable state, but low enough to avoid homogeneous nucleation as described below in paragraphs 42-43. The respective levels are clearly a function of the working liquid selected as well as the measurement conditions (e.g. T).

[0042] An objective standard for a metastable state can be defined to be a fluid state where homogeneous self-nucleation of bubbles due to statistical fluctuations can grow uncontrollably at the limit of homogeneous nucleation. The time involved for such an effect is on the order of nanoseconds. Therefore, metastable states not at the limit of self-nucleation from statistical fluctuations generally involve time frames that are orders of magnitude longer than the

nanosecond range. Upon application of suitable cavitation initiation energy to the metastable liquid, such as from neutrons, alpha particles or laser beam heating, the growth to critical bubble radii can be in the nanosecond range.

[0043] As used herein, the phrase "deep metastable state" represents a set of conditions which approach, but do not exceed conditions required for homogeneous flash nucleation of the particular working liquid into a vapor state. The attainment of a deep metastable state imparts significant potential energy into a suitable working liquid which can be released upon application of an appropriate energetic signal from a cavitation initiation source. The deeper the metastable state, the less energy is required from the cavitation initiation source to bubble nucleate at least one bubble having a radius greater than the critical radius for the working liquid.

The action of the cavitation initiation source on the tensioned liquid portion is also clearly described in Applicant's specification (see paragraphs 49-50 copied below)

[0049] Cavitation initiation source 105 emits energetic particle or wave energy 140, the energy 140 directed to strike metastable region 125. Cavitation initiation source 105 directs cavitation source energy to the metastable liquid region 125 sufficient to bubble nucleate at least one bubble having a bubble radius greater than a critical bubble radius of the liquid. The critical bubble radius (r_{crit}) is a function of the pressure within the bubble (P_{bubble}), the ambient pressure ($P_{ambient}$) and the surface tension of liquid (σ) and is given by the following equation:

$$r_{crit} = 2\,\sigma / (P_{bubble} - P_{ambient})$$

[0050] The formation of at least one bubble having a radius of at least the critical radius (r_{crit}) given above permits the bubble to grow and leads to release of at least a portion of the energy stored by the metastable working liquid. The amount of resulting energy produced is controlled by the stored potential energy in the working liquid (e.g. pre-tension level) combined with the energy supplied by the initiation source 105.

.

Paragraph 54 discloses the [cavitation] initiation source 105 can be controlled to affect a small portion of a liquid 110 or the entire liquid 110.

[0054] The initiation source 105 can be controlled to affect a small portion of a liquid 110 or the entire liquid 110. If neutrons are used, the beam of neutrons could be collimated to a desired size to affect a given size volume of liquid depending on how large or small a region is desired to be cavitated. For example, a cavitation process could be controlled with the number of nucleators emitted by the cavitation initiation source (e.g. neutrons) in conjunction with how far the system is from the homogeneous nucleation temperature.

Moreover, paragraph 96 discloses:

[0096] The resulting bursts can take place either locally when a selected portion of the liquid is fractured such that the balance of the pre-tensioned liquid is propelled as projectiles, or when substantially the entire liquid volume undergoes homogeneous nucleation into the vapor phase and results in explosive phase change-induced power bursts. Explosive phase change-induced power bursts are turbo-charged by the intense pre-tension related pressure work component. It is also possible to control the timing of occurrence and the intensity level of the bursts by controlling the flux rate of the initiation energy applied.

Accordingly, the 35 USC 112 rejection based on the term "portion" should be removed.

Turning now to rejections based on 35 USC 112, paragraph 1, according to the Examiner:

4. The specification is objected to under 35 U.S.C. 112, first paragraph, as failing to provide an adequate written description of the invention and as failing to adequately teach how to make and/or use the invention, i.e. failing to provide an enabling disclosure.

The elected invention is directed to an apparatus that places a liquid in a tension state and cavitating the liquid with nuclear particles that include alpha emitters, neutron sources and fission fragments (e.g., see claims 1 and 10). Such cavitation process result in nuclear fusion reactions, as per the following applicant's statements in the specification:

> *"Nuclear energetics, such as initiation of nuclear fusion reactions, can result from the cavitation process and increase the above energy level values by a factor of up to 10 sup.6. For example, implosive dynamics producible by the invention could be robust enough to lead to nuclear fusion. If so, deuterium-deuterium (D-D) or deuterium-tritium (D-T) nuclear reactions can take place. The energy density of release from D-D or D-T reactions is close to 10 sup.6 times greater than that available from conventional chemical explosives" See paragraph bridging pages 21 and 22.*

Ionizing particle techniques utilize fundamental particles, such as neutrons, alpha particles or fission fragments. These particles have been demonstrated to be able to interact with individual nuclei of the target liquid atoms to permit nanosecond timed initiation of explosive vaporization. This invention can also utilize a variety of nucleating agents, such as dissolved alpha emitters, dissolving fissioning nuclei and the use of externally generated neutrons from small hand-held isotopic sources (such as californium or Pu--Be) or using pulsed neutron sources that are based on D-D and D-T reactions and produce 4 Mev and 14 Mev neutrons, respectively. Such sources of nucleating agents are readily available for safe use (with appropriate shielding). See paragraph bridging pages 30 and 31.

Moreover, according to the Examiner:

It is not seen wherein the specification discloses any particular structure, etc., which is unique to applicants' system and which makes applicants system operative whereas the systems disclosed in the above referenced "numerous teachings by skilled artisans", are not operative.

Further, according to the Examiner:

There is neither an adequate description not enabling disclosure of the parameters of a specific operative embodiment of the invention, including the exact composition (including the impurities and amounts thereof) of the acetone, the operating pressure and spin rate for acetone, amount of dissolved gases in the acetone, specific geometry and surface conditions of the structures surrounding the acetone, etc. Impurities can have an adverse effect on the desired operation of the invention, as applicant himself admits that impurities can make a liquid unsuitable for the invention (e.g., see page 19+).

It is thus considered that the examiner (for the reasons set forth above) has set forth a reasonable and sufficient basis for challenging the adequacy of the disclosure. The statute requires the applicant itself to inform, not to direct others to find out for themselves; In re Gardner et al, 166 U.S.P.Q. 138, In re Scarbrough, 182 U.S.P.Q. 298. Note that the disclosure must enable a person skilled in the art to practice the invention without having to design structure not shown to be readily available in the art; In re Hirsch, 131 U.S.P.Q. 198.

Applicant respectfully notes the Examiner's reliance on the nuclear fusion aspect disclosed in Applicant's application is erroneous because written description and enablement are measured based SOLELY ON THE CLAIMED INVENTION as defined in the MPEP copied below, as well as related case law. The claimed invention recites a burst generator, and does not claim in any way a nuclear fusion reactor.

Written description is solely based on the *claimed* invention.

2163 The Written Description Requirement

The written description requirement has several policy objectives. "[T]he `essential goal' of the description of the invention requirement is to clearly convey the information that an applicant has invented the subject matter which is claimed." In re Barker, 559 F.2d 588, 592 n.4, 194 USPQ 470, 473 n.4 (CCPA 1977), cert. denied, 434 U.S. 1064 (1978). Another objective is to put the public in possession of what the applicant claims as the

invention so that the public may ascertain if the patent applicant claims anything that is in common use, or already known. Evans v. Eaton, 20 U.S. (7 Wheat.) 356 (1822).

An applicant's specification must convey with reasonable clarity to those skilled in the art that, as of the filing date sought, he or she was in possession of the invention, i.e., whatever is now claimed. Vas-Cath, Inc. v. Mahurkar, 935 F.2d 1555, 1563-64, 19 USPQ2d 1111, 1117 (Fed. Cir. 1991). The written description requirement prevents an applicant from claiming subject matter that was not described in the application as filed, and the proscription against the introduction of new matter in a patent application (35 U.S.C. 132 and 251) serves to prevent an applicant from adding to the informational content of a patent application after it is filed.

2163.01 Support for the Claimed Subject Matter in Disclosure

A written description requirement issue generally involves the question of whether the subject matter of a claim is supported by [conforms to] the disclosure of an application as filed. If the examiner concludes that the claimed subject matter is not supported [described] in an application as filed, this would result in a rejection of the claim on the ground of a lack of written description under 35 U.S.C. 112, first paragraph or denial of the benefit of the filing date of a previously filed application. The claim should not be rejected or objected to on the ground of new matter. As framed by the court in In re Rasmussen, 650 F.2d 1212, 211 USPQ 323 (CCPA 1981), the concept of new matter is properly employed as a basis for objection to amendments to the abstract, specification or drawings attempting to add new disclosure to that originally presented. While the test or analysis of description requirement and new matter issues is the same, the examining procedure and statutory basis for addressing these issues differ. See MPEP Section 2163.06.

2163.02 Standard for Determining Compliance With the Written Description Requirement

The courts have described the essential question to be addressed in a description requirement issue in a variety of ways. An objective standard for determining compliance with the written description requirement is, "does the description clearly allow persons of ordinary skill in the art to recognize that he or she invented what is claimed." In re Gosteli, 872 F.2d 1008, 1012, 10 USPQ2d 1614, 1618 (Fed. Cir. 1989). Under Vas-Cath, Inc. v. Mahurkar, 935 F.2d 1555, 1563-64, 19 USPQ2d 1111, 1117 (Fed. Cir. 1991), to satisfy the written description requirement, an applicant must convey with reasonable clarity to those skilled in the art that, as of the filing date sought, he or she was in possession of the invention, and that the invention, in that context, is whatever is now claimed. The test for sufficiency of support in a parent application is whether the disclosure of the application relied upon "reasonably conveys to the artisan that the inventor had possession at that time of the later claimed subject matter." Ralston Purina Co. v. Far-Mar-Co., Inc., 772 F.2d 1570, 1575, 227 USPQ 177, 179 (Fed. Cir. 1985) (quoting In re Kaslow, 707 F.2d 1366, 1375, 217 USPQ 1089, 1096 (Fed. Cir. 1983)).

Whenever the issue arises, the fundamental factual inquiry is whether a claim defines an invention that is clearly conveyed to those skilled in the art at the time the application was filed. The subject matter of the claim need not be described literally (i.e., using the same terms or in haec verba) in order for the disclosure to satisfy the description requirement. If a claim is amended to include subject matter, limitations, or terminology not present in the application as filed, involving a departure from, addition to, or deletion from the disclosure of the application as filed, the examiner should conclude that the claimed subject matter is not described in that application. This conclusion will result in the rejection of the claims affected under 35 U.S.C.112, first paragraph - description requirement, or denial of the benefit of the filing date of a previously filed application, as appropriate.

2163.04 Burden on the Examiner With Regard to the Written Description Requirement

The inquiry into whether the description requirement is met must be determined on a case-by-case basis and is a question of fact. In re Wertheim, 541 F.2d 257, 262, 191 USPQ 90, 96 (CCPA 1976). The examiner has the initial burden of presenting evidence or reasons why persons skilled in the art would not recognize in an applicant's disclosure a description of the invention defined by the claims. 541 F.2d at 265, 191 USPQ at 98. See also Ex parte Sorenson, 3 USPQ2d 1462, 1463 (Bd. Pat. App. & Inter. 1987).

I. STATEMENT OF REJECTION REQUIREMENTS

Any time an examiner bases a rejection of a claim or the denial of the effect of a filing date of a previously filed application on the lack of a written description, the examiner should: (A) identify the claim limitation not described; and (B) provide reasons why persons skilled in the art at the time the application was filed would not have recognized the description of this limitation in the disclosure of the application as filed. A typical reason points out the differences between what is disclosed and what is claimed. A simple statement that "There does not appear to be a written description of the claim limitation `_____' in the application as filed." may be sufficient where the support is not apparent and the applicant has not pointed out where the limitation is supported.

Turning now to the assertion of lack of adequate description, such as regarding operating parameters, Applicant first notes the application (paragraph 60) clearly and unambiguously teaches use of liquids which have impurity and dissolved gas levels as low as possible.

[0060] Generally, the presence of impurities and dissolved gases causes liquids to cavitate with only modest applied tensions. This would make these liquids generally

unsuitable for use with the invention. For example, cavitation of ordinary tap water has been demonstrated with only a few psi of tension, due to impurities in the water. [4]. However, the maximum possible extent of pretensioning a liquid prior to onset of cavitation for a substantially purified low density liquid such as water, and a high density liquid such as mercury can be quite large [5, 6]. Purified or distilled water may reach approximately -1,400 bar (-20,000 psi) and mercury -17,000 bar (-250,000 psi).

Moreover, claim 1 now recites use of a degassed liquid in the claimed burst generator.

As for tensioning levels, such as derived from spin rate for a centrifugal tensioning apparatus, as noted above the application teaches attainment of a "deep metastable state" which as noted above represents a set of conditions which approach, but do not exceed conditions required for homogeneous flash nucleation of the particular working liquid into a vapor state. Figure 4 even provides data regarding variation of pretension pressure versus rotation speed an arm length for a centrifugal tensioning apparatus.

Regarding the examiner's request for Applicant to identify unique aspects of the present invention, as will be described in more detail below in the related art section, the claim burst generator includes the following unique aspects:

i) "degassed liquid" and

ii) a "source of fundamental particles for directing fundamental particles at said liquid portion for cavitating said liquid portion sufficiently to bubble nucleate at least one bubble having a bubble radius greater than a critical bubble radius of said liquid.

Further, Applicant again refers to the Examples section of the present application (copied above) which include exemplary parameters that were used to demonstrate

operability of the claimed invention. The Examples provided describe proof-of-principle experiments with organic and inorganic liquids for placing various liquids under tension and then perturbing the system using fundamental particles including neutrons to initiate explosive vaporization within nanoseconds. The Examples further describe demonstrated controlled explosive bursts generation coupled to launch projectiles. Experiments conducted with a spinner arrangement are also described using a working liquids, such as ethanol or acetone which provided the force to launch projectiles. Upon reaching a certain state of pretension the system was nucleated with an external fast neutron source (Pu-Be). The vaporization of fluid in the central bulb caused a fast pressure surge that ejected a projectile.

In the example described, 20kHz experiments were performed using a glass chamber filled with acetone. The cavitation initiating source for nucleated vapor cavities used was a neutron source. The vapor cavity growth produced measured power surges of close to 5-10 kW even though the driving power from the 20kHz drive transducers was only in the 1-5W range. Similar experiments were performed using C_2Cl_4 as the working liquid with similar results.

Accordingly, the 35 USC 112, paragraph 1 rejections should be removed.

Turning now to cited art, according to the Examiner:

Claims 1, 10 and 14 are rejected under 35 U.S.C. §102(b) as being anticipated by either one of Putterman et al. (U.S. 5,659,173) or Flynn (U.S. 4,333,796).

Either one of Putterman et al. or Flynn disclose a burst generator for implosion of a liquid containing hydrogen isotopes, i.e., water (e.g., see Abstract in Putterman or col. 1, lines 20+ in Flynn).

As to the structure for tensioning of the liquid, either one of Putterman et al. or Flynn inherently meets this limitation because they apply acoustic waves to the working liquid that generates pressure and tensions of the liquid.

As to the structure for cavitating the tensioned liquid, either one of Putterman et al. or Flynn inherently meets this limitation because their system includes nuclear particles such as deuterium or tritium that have not interacted with other particles and therefore inherently available for cavitation.

Flynn is entitled "Method of generating energy by acoustically induced cavitation fusion and reactor therefor" and discloses two different cavitation fusion reactors (CFR's). Each comprises a chamber containing a liquid (host) metal such as lithium or an alloy thereof. Acoustical horns in the chamber walls operate to vary the ambient pressure in the liquid metal, creating therein small bubbles which are caused to grow to maximum sizes and then collapse violently in two steps. In the first stage the bubble contents remain at the temperature of the host liquid, but in the second stage the increasing speed of collapse causes an adiabatic compression of the bubble contents, and of the thin shell of liquid surrounding the bubble. Application of a positive pressure on the bubble accelerates this adiabatic stage, and causes the bubble to contract to smaller radius, thus increasing maximum temperatures and pressures reached within the bubble. At or near its minimum radius the bubble generates a very intense shock wave, creating high pressures and temperatures in the host liquid. These extremely high pressures and temperatures occur both within the bubbles and in the host liquid, and cause hydrogen isotopes in the

bubbles and liquid to undergo thermonuclear reactions. In one type of CFR the thermonuclear reaction is generated by cavitation within the liquid metal itself, and in the other type the reaction takes place primarily within the bubbles. The fusion reactions generate energy that is absorbed as heat by the liquid metal, and this heat is removed from the liquid by conduction through the acoustical horns to an external heat exchanger, without any pumping of the liquid metal.

Flynn's method is thus based on a vessel filled with gaseous isotopically enriched liquid that is agitated using ultrasonic horns which randomly nucleate bubbles. Flynn hypothesized (just like Putterman -1997, without providing any experimental evidence for operability) that the SL producing bubbles "may" become hot enough to produce the tell-tale signs of thermonuclear fusion, viz., 2.45 MeV neutrons and tritium.

Flynn's method has little relevance to the claimed invention since Flynn does not disclose or suggest:

i) using the claimed "degassed liquid" or

ii) the claimed "source of fundamental particles for directing fundamental particles at said liquid portion for cavitating said liquid portion sufficiently to bubble nucleate at least one bubble having a bubble radius greater than a critical bubble radius of said liquid"

Applicant notes that the deuterium or tritium disclosed by Flynn is clearly not the claimed fundamental particles which as noted above are well known in the art to be particles which make up the nuclei of all atoms, such as neutrons and alpha particles , nor do they have sufficient energy to cause nucleation since they have only their thermal energy (about 0.01 eV). There is no means provided to accelerate them from their energy at ambient temperature (about 0.01 eV) to the approximate minimum levels of about

Million eV (1 MeV) required for the nucleation of critical size vapor bubbles to take place and that too only when the liquid is tensioned metastable pressure state. Accordingly, the claimed invention recited in claim 1 and its respective dependent claims are patentable over Flynn.

Putterman is entitled "Converting acoustic energy into useful other energy forms" and discloses sonoluminescence is an off-equilibrium phenomenon in which the energy of a resonant sound wave in a liquid is highly concentrated so as to generate flashes of light. The conversion of sound to light represents an energy amplification of eleven orders of magnitude. The flashes which occur once per cycle of the audible or ultrasonic sound fields can be comprised of over one million photons and last for less 100 picoseconds. The emission displays a clocklike synchronicity; the jitter in time between consecutive flashes is less than fifty picoseconds. The emission is blue to the eye and has a broadband spectrum increasing from 700 nanometers to 200 nanometers. The peak power is about 100 milliWatts. The initial stage of the energy focusing is effected by the nonlinear oscillations of a gas bubble trapped in the liquid. For sufficiently high drive pressures an imploding shock wave is launched into the gas by the collapsing bubble. The reflection of the shock from its focal point results in high temperatures and pressures. The sonoluminescence light emission can be sustained by sensing a characteristic of the emission and feeding back changes into the driving mechanism. The liquid is in a sealed container and the seeding of the gas bubble is effected by locally heating the liquid after sealing the container. Different energy forms than light can be obtained from the converted acoustic energy. When the gas contains deuterium and tritium there is the

feasibility of the other energy form being fusion, namely including the generation of neutrons.

Putterman discloses apparatus with a preset "single" levitated "gas" (not vapor from the working liquid) bubble that is periodically (continuously) expanded by factors of ~ 10 from the initial radius and imploded back. Putterman hypothesized without any experimental evidence that if the implosion can be made robust enough, a shock wave can be launched and flashes of sonoluminescence (SL) light are produced. Furthermore, Putterman hypothesizes (without showing experimental proof of operability, i.e., via measurement of neutrons and tritium) that if the plasma is hot and compressed enough, then nuclear fusion may be made to occur to produce the tell-tale signs of thermonuclear fusion (2.45 MeV neutrons and tritium).

Putterman does not disclose or suggest Applicant's claimed degassed liquid. Putterman cannot degass his system since Putterman requires a gas bubble to be present in the liquid, which means a gassy liquid IS a precondition for their method which relies on rectified diffusion to attain SL. In such apparatus, gas in the liquid is required for it to function. Otherwise, in a totally degassed liquid a gas bubble can neither be generated using the hot-wire approach of Putterman et al. (1997) and also not remain if injected – because by the laws of partial pressures the gas/it has to go back into the liquid solution. This same shortcoming is also found in Flynn. In contrast, the claimed invention uses a degassed liquid so that the working liquid is essentially bubble free prior to irradiation with fundamental particles, so that the bubbles used are vapor from the working isotopic liquid, not generally ambient gas bubbles in the working liquid.

Although having more relevance than Flynn's method to the claimed invention, Putterman's single standing bubble filled with gas in inorganic liquid process thus does not disclose or suggest any of the following:

i) using the claimed "degassed liquid" or

ii) the claimed "source of fundamental particles for directing fundamental particles at said liquid portion for cavitating said liquid portion sufficiently to bubble nucleate at least one bubble having a bubble radius greater than a critical bubble radius of said liquid"

Applicants note that like Flynn, the deuterium or tritium disclosed by Putterman are clearly not the claimed fundamental particles which are well known in the art to be particles which make up the nuclei of all atoms, such as neutrons and alpha particles, nor do they have sufficient energy to cause nucleation since they have only their thermal energy (about 0.01 eV). Again, like Flynn, in Putterman there is no means provided to accelerate them from their energy at ambient temperature (about 0.01 eV) to the approximate minimum levels of about Million eV (1 MeV) required for the nucleation of critical size vapor bubbles to take place and that too only when the liquid is tensioned metastable pressure state.

Accordingly, the claimed invention recited in amended claim 1 and its respective dependent claims are patentable over Putterman.

Although Applicant respectfully disagrees with the rejection of many of the pending dependent claims, due to the patentability of amended claim 1, this issue is believed to be moot.

Applicant believes the present application is in condition for allowance. Should the Examiner feel otherwise for any reason, Applicant requests the Examiner to call the

undersigned before issuance of any office action to set up a telephonic interview to expedite the prosecution of the present application to an allowance.

No fees are believed due with this request other than the fee for the one-month extension. However the Commissioner for Patents is hereby authorized to charge any deficiency in fees due with the filing of this document and during prosecution of this application to Deposit Account No. 50-0951.

Respectfully submitted,

AKERMAN SENTERFITT

Date: March 5, 2007

Neil R. Jetter, Registration No. 46,803
AKERMAN SENTERFITT
P.O. Box 3188
West Palm Beach, FL 33402-3188
Tel: 561-653-5000

Docket No. 6321-202

Annotated

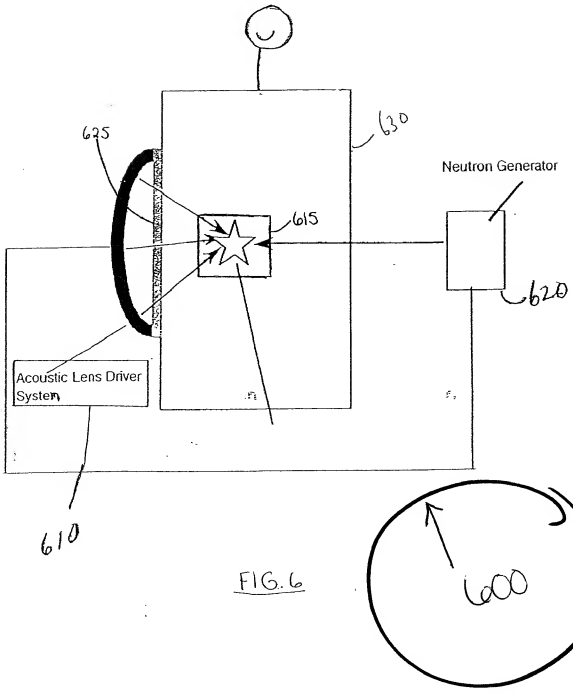

FIG. 6

Annotated

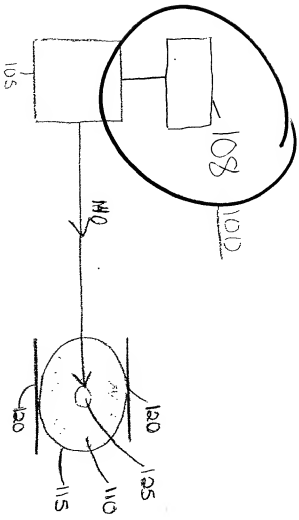

FIG. 1